State of North Carolina
Department of Administration
Purchase and Contract Division

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SPECIFICATION FOR LINERS, BAGS, PLASTIC, DISPOSABLE

(This specification is released for procurement purposes until revised or rescinded.)

Scope

This specification covers plastic bags intended for general use as can liner inserts in waste receptacles for office trash, cafeteria waste including plastic utensils, highway trash, yard debris and highway rest stops receptacles that typically contain a large portion of liquids and various containers. This specification also covers the special purpose of disposing of bio-hazardous waste in accordance with the North Carolina Department of Environmental Protection.

I. Classification

Liners and bags covered by this specification shall be of the following type and style shown below:

Type I - polyethylene liners for general use.
Style 1 - Low density or linear low density. Refer to Table 1.
Style 2 - High density. Refer to Table 2.

Type II - polyethylene liners for roadside trash collection and rest stops for the Dept. of Transportation.
Style 1 – Various density materials. Refer to Table 3.

Type III - polyethylene liners for trash and utility use for the Department of Corrections.
Style 1 - Low density or linear low density. Refer to Table 4.

Type IV - polyethylene liners for disposal of bio-hazardous materials.
Style 1 - Low density or linear low density. Refer to Table 5.

II. Applicable documents

The following specifications, standards, and regulations, or applicable parts thereof, of issues in effect on date of Invitation to Bid, shall form part of this specification, as referenced.

ASTM - D2103-03 Standard Specification For Polyethylene Film And Sheeting (05)

ASTM - D1709-04 Impact Resistance Of Polyethylene Film By The Free-Falling Dart Method.

ASTM - D1922-03a Propagation Tear Resistance Of Plastic Film And Thin Sheeting By Pendulum Method.

III. Requirements

Principle characteristics - Types I through IV bags shall possess the following characteristics of construction, color, tolerances, and seam strength as shown below:

A. Construction

1. Bags may be constructed with any type seal, except low density bags designated as heavy load duty rating in Tables 1 through 5 are provided with a flat type seal. The seal provided for medium and heavy duty bags shall be leakproof including gusseted construction if employed. The 40x48 inch DOT bag in Table 3 shall be provided with a flat side weld only. Seams on all bags shall meet or exceed the required load, capacity and physical properties as stated in Tables 1 through 5.

2. Slip - bags shall be easily and readily opened by hand.

B. Materials

Liner material shall be formulated from polyethylene containing octane, butane or hexene type copolymer resins with a minimum of 10% post-consumer or 10% pre-consumer reprocessed copolymer.

Low Density (LD) / Linear Low Density (LLD) type bags shall have a density between 0.915 grams/cc to 0.923 grams/cc.

High Density (HD) type bags shall have a density of 0.940 grams/cc to 0.955 grams/cc.

No additives shall be included to the polyethylene that decrease the stability, storage or use requirements of the can liners bid.

C. Physical properties

Physical properties of plastic bags are shown in Tables 1 through 5.

D. Load, Capacity, and Duty Rating

The load rating in weight is documented for each can liner in Tables 1 through 5. A reference is also provided for the liquid capacity in gallons, which is only a reference to the volume of a typical trash receptacle for which a can liner may be used. Refer to the “Product Testing” section to determine the liquid load capacity by weight that a can liner is expected to contain without leaks.

The load duty designations of light, medium or heavy duty are defined for each can liner in Tables 1 through 5. The load duty specification determines the method used to test a bag with a load or weight.

Medium and heavy duty can liners from Tables 1 through 3 are expected to handle cafeteria waste that may contain plastic utensils, knives and forks without puncture, split or tears. These bags are also required to contain liquids without leaking or rupture. Heavy duty can liners from Table 3 may also be used in cafeteria applications or where limbs and yard waste are to be contained.

E. Color

Type I bags depicted in Tables 1 and 2 are for use in waste receptacles may be natural (essentially colorless), buff, brown, green, or black at the option of the manufacturer, unless otherwise stated in the Invitation for Bid.

Type II bags shall be orange, white, blue or black in color, as specified in Table 3. Bags may be provided with markings as described in the following Paragraph K as applicable.

Type III bags depicted in Table 4 are used for detention facilities shall be clear and allow easy visibility of items enclosed.

Type IV bags depicted in Table 5 are for bio-hazardous waste shall be red or yellow in color and opaque with markings as described in the following Paragraph I and Paragraph J.

F. Tolerances

In addition to the following tolerance guidelines, refer to the Section VI for formulas to determine liner thickness based upon a measured net case (film) weight or quantity of bags per case.

1. Dimensions - Linear dimensions shall be inside measurements, exclusive of seals or seams. A tolerance of minus 1 inch shall be permitted in liner length. Length dimension shall be measured with bag lying in a flat position from center of top to center of bottom. A tolerance of minus 1/2 inch is permitted on the liner circumference.

2. Thickness – All can liners must comply with mil or micron thickness as requested in the Invitation for Bid document. **No negative tolerance is allowed.**

3. Net Case (Film) Weight - All can liners must comply with the minimum net case (film) weight as determined by the formula provided herein and/or provided in the Invitation for Bid document. **No negative tolerance is allowed.**

4. Bags per Case Quantity – The number of can liners provided per case must comply with the Invitation for Bid document. **No negative tolerance is allowed.**

G. Workmanship

Liners and bags shall be uniform in color, texture, and finish and in all physical properties. They shall be free from pinholes, tears, cuts, creases, wrinkles, extraneous matter or other defects that may impair their serviceability or appearance.

H. Twist Ties

Twist ties or other restraining devices **are required to be either included in each case of liners** or otherwise supplied in adequate quantities to cover the amount of liners procured.

Twist ties are **not permitted for inclusion with can liners intended for Department of Corrections use** as covered in Table 4. Inclusion of twist ties for this style bags is unacceptable and may be rejected and returned. The State of North Carolina reserves the right to cancel the contract if this occurs.

I. Type IV bags for containment of bio-hazardous waste-on-site applications

1. Bio-hazardous waste, other than sharps, shall be contained in two opaque disposable bags, each having a minimum thickness of 1.5 mil, providing a total bag thickness of at least 3.0 mils. The bags shall be individually tied.

2. Bags used for containment of infectious waste shall be red in color, opaque, and conspicuously labeled with the following:

    1. The words "infectious waste".
    2. The word "biohazard" and the universal biohazard symbol.

J. Type IV bags for containment of bio-hazardous waste - off-site transportation applications

1. Bio-hazardous waste, other than sharps, shall be contained in two opaque disposable bags, each having a minimum thickness of 3.0 mil, providing a total bag thickness of at least 6 mils. The bags shall be individually tied.

2. Bags used for containment of infectious waste shall be red in color, opaque, and conspicuously labeled with one of the following:

1. The words "infectious waste".
2. The word "biohazard" and the universal biohazard symbol.

3. Bags used for containment of chemotherapeutic waste shall be yellow in color, opaque, and conspicuously labeled with one of the following:

    1. The words "chemotherapeutic waste".
    2. The word "biohazard" and the universal biohazard symbol.

4. If bio-hazardous waste is transported off-site in fiberboard containers, or their equivalent, it shall be contained in two disposable polyethylene bags of appropriate color and marking, each having a minimum thickness of 1.5 mil, providing a total bag thickness of at least 3 mils.

K. Type II bags for roadside trash collection

1. Bags used for roadside trash collection by the Department of Transportation are constructed with the following colors and markings:

    1. Orange in color.
    2. Blue in color.
    3. White in color and imprinted with black letters “CWSP / DOT” to indicate Community Work Service Project.

L. Storage

The product shall remain stable while in storage from 32 degrees F to 110 degrees F for a minimum perioid of one year. The product shall also remain stable while containing liquids or other biodegradable materials for the same term.

Any product that has storage or use requirements different from can liners constructed of virgin polyethylene resin shall be identified as how the product differs with the storage and use limitations clearly indicated in the response to the bid.

IV. Sampling, Inspection and Testing

A. Sampling

Random samples - samples of delivered items may be randomly selected and tested for compliance with these specifications. If it is found that delivered commodities are not equal to or better than the samples originally tested, the Division of Purchase and Contract may proceed as stipulated in the "General Terms and Conditions" of the bid.

B. Inspection

Inspection may be made at the place of manufacture at the option of the State of North Carolina. In all instances, inspection for final acceptance may be made at the place of delivery and/or after laboratory testing to determine whether material and workmanship meet the quality specified herein and in the invitation for bid.

Inspection shall also be allowed at the film manufacturer or at the contractor’s stocking location by a representative of the State of North Carolina or by a representative of the Division of Weights and Standards of the state where located for the purpose of inspection or verification of compliance for liners produced to this specification.

C. Product Testing

The State reserves the right to perform any testing where such tests are deemed necessary to assure that products and services conform to the prescribed requirements. This may also include product testing in the end use.

The State also reserves the right to request testing by a third party independent laboratory to determine compliance with the specifications during the bid evaluation and the contract duration. The bidder is responsible for providing the additional samples and verification test results. All cost associated with the testing shall be borne by the bidder.

Representative samples submitted for evaluation to represent an assigned group of can liners as specified in the Invitation for Bid, may disqualify all the can liners for that assigned group if the sample provided is determined to be noncompliant with the specifications herein, regardless of manufacturer.

The bag liners must be capable of successfully completing the following load capacity tests.

1. Conditioning - prior to test, the liners shall be conditioned for 48 hours at 73 degrees F (+/- 10 degrees F) and 50 percent relative humidity (+/- 4 percent).

2. Impact resistance (dart test) shall be conducted at a height of 26 inches. Resistance shall be measured in grams, minimum in accordance with ASTM D-1709, method A.

3. Tear strength shall be measured in grams for the machine blow molded direction (MD), minimum in accordance with ASTM D-1922 (elmendorf tear tester). Bags used for bio-hazardous waste disposal shall also be tested in the transverse direction (TD).

4. Load capacity testing

    A. The description for the load capacity tests for Low Density or Linear Low Density can liners rated light, medium and heavy duty is given below.

        1. Light duty bags - a group of paper backed books and/or magazines weighing 1/2 to 4 lbs. For each group and whose total weight equals the test load specified shall constitute the test load for light duty bags.

        2. Medium and heavy-duty bags - a group of full metal cans weighing 1.0 to 2 lbs. each and whose total weight equals the test load specified shall constitute the test load for medium and heavy-duty bags.

        3. The bag may be placed in a clean container with smooth sides while adding the test load. After adding the test load, the bag shall be grasped or clamped within 12 inches from the top, removed from the container (if used), and raised by hand or mechanical means until the bottom of the bag is 12 inches from the floor. The bags shall be held in this position for 1 minute. Any spillage or leakage of the test load or undue elongation will constitute failure of the test.

        4. A liquid load capacity test shall be performed in addition to the solid waste load capacity test for the medium and heavy duty bags. Previously untested sample bags shall be tested. The bag shall be grasped and clamped to an open section of pipe within 12 inches from the top of the bag. With the bag suspended a volume of water at 70 degrees F, plus or minus 10 degrees, whose weight equals that of 50% of the dry test load specified in the tables, shall be slowly introduced into the bottom of the bag through the pipe and shall constitute the test load. A liquid load equal to the full dry load capacity shall be used to test the bio-hazardous waste bags. The bags shall be held in this position for 1 minute. Any leakage of the test load or undue elongation (maximum 200%) will constitute failure of the test.

5. Failure of two of three sample bags tested as outlined above shall constitute a disqualification of an evaluation.

B. The description for the load capacity tests for High Density can liners rated light, medium and heavy duty bags is given below.

1. The bags shall support a load of charcoal briquettes (equal to the test load specified) without spillage of contents. Bags shall be placed in an open top container or receptacle of a comparable size to that of the open bag. The interior of the receptacle shall be clean and smooth so as not to tear or puncture the bag. Spread the bottom of the bag out on the bottom of the receptacle and add the specified weight to the bag. The empty portion of the bag shall be gathered together so as to squeeze out the excess air. The bag shall be grasped within 12 inches of the top and lifted out of the receptacle. After raising the filled bag to a height whereby the bottom is a minimum of 12 inches above the floor, the bag shall be held motionless without other support for 1 minute. Any spillage of briquettes constitutes failure of the test. Leakage of charcoal dust shall not constitute a failure.

2. A liquid load capacity test shall be performed in addition to the solid waste load capacity test for the medium and heavy duty bags. Previously untested sample bags shall be tested. The bag shall be grasped and clamped to an open section of pipe within 12 inches from the top of the bag. With the bag suspended a volume of water at 70 degrees F, plus or minus 10 degrees, whose weight equals that of 65% of the dry test load specified in the tables, shall be slowly introduced into the bottom of the bag through the pipe and shall constitute the test load. The bags shall be held in this position for 1 minute. Any leakage of the test load or undue elongation (maximum 200%) will constitute failure of the test.

3. Failure of two of three sample bags tested as outlined above shall constitute a disqualification of an evaluation.

V. Submittals with the Bid Response

A. Submittal

All line items require the following in response to each Invitation For Bid.

1. Test samples, properly marked with full identification. Each shall be marked with a label identifying the bidder's company name, bid number, item number and manufacturer's stock number. Samples submitted for each group (Type and Style) shall packaged separately (large manila envelope or similar) and also labeled with the bidder's company name, bid number, and group (Type and Style). The submittal of all samples may be packaged in a single shipping container as appropriate.

VI. Packing, Marking and Product Test Reports

A. Packing

The packing and packaging shall be in accordance with the industries standard practice in a manner to insure carrier acceptance and safe, undamaged delivery to destination.

1. Quantity per case - the actual count of liners per case shall not be less than the manufacturer's labeled quantity or as required in accordance with the Invitation For Bid document.

B. Marking

1. Each individual case should be marked clearly with the production lot numbers, name of the contents, catalog designation, size, mil wall thickness, liner color, quantity of the liners (bags), the contract number of the award, and the contractor's name and/or trademark and address. Packages for bio-hazardous bags shall be marked accordingly.

2. Each pallet shall be marked clearly with the name of the contents, the number of individual packages contained, the contract number, and the name of the contractor and the receiving party as shown on the face of the contract order. Containers used for bio-hazardous bags shall be marked accordingly.

C. Formulas

Receiving agencies/users as a verification of the marked package quantity by weight may use the following formulas:

1. The formula for the liner net weight (lbs., pounds) per 100 liners is based on (1) minimum wall thickness specifications (gauge), (2) liner density specification and (3) a constant factor, applicable to all sizes and capacity liners.

   The liner density specification shall be as certified by the manufacturer in compliance with Paragraph B (Material). For the mandatory receiving case weight the minimum density values of 0.915 grams/cc will be used for the Low Density (LD) / Linear Low Density (LLD) materials and 0.940 grams/cc will be used for the High Density (LHD) materials.

   The constant factor in the formula automatically takes into account converting of cu. cm. measurement to cu. inches; each bag has two sides, and converting gram weight into pound weight. The constant factor is 13,840 and is included in formula listed below.

$$\frac{[\text{½ circumference}] \times [\text{length}] \times [\text{gauge}] \times [\text{no. of liners} \times \text{density}]}{[\text{Factor (13,840)}]} = \text{Weight (lbs) of liners per case quantity}$$

   Where:

   Gusseted or star sealed bags dimensions are designated “Width x Depth x Length”
   ½ Circumference = Width (of bag opening)+ Depth (width of opposite side of bag opening)

   Flat bags dimensions are designated “Width x Length”
   ½ Circumference = Width

   Circumference and length are measured in inches,
   Thickness or Gauge is in mils
   To Convert Mils to microns: mils * 25.4 = microns
   To Convert Microns to mils: microns / 25.4 = mils

   The example {a} used to demonstrate the formula is a (LLD) liner size 23" x 10" x 39" gusseted bag, 1.6 mil wall thickness (gauge) in a quantity of 100 per case.

$$\{a\} \quad \frac{(23+10) \times 39 \times 1.6 \times 100 \times 0.915}{13840} = 13.6 \text{ lbs}$$

   The example {b} is used to demonstrate the formula is a (HD) liner size 33" x 40" flat bag, 11 micron wall thickness (gauge) in a quantity of 100 per case.

{b}

convert liner thickness from micros to mils:
11 microns / 25.4 = 0.433 mils

$$\frac{33 \times 40 \times 0.433 \times 100 \times 0.94}{13840} = 3.9 \text{ lbs}$$

D. Product Test Reports

Bidder shall provide a manufacturer's test report of any delivered lot number(s) of bags, at any time during the contract, within five (5) days of request. The costs of any testing required for the test reports shall be the responsibility of the bidder. Such test reports shall contain:

(a) date of the test report
(b) manufacturer's name and location
(c) production lot number
(d) identity of the test laboratory (which may be the manufacturer's facility)
(e) contract line item of the bag being tested
(f) measured bag thickness
(g) tested load capacity
(h) tested impact resistance in grams
(i) tested tear strength in grams
(j) the name and title of the responsible personnel performing the testing
(k) the name and title of the technical reviewer of the testing performed

If required in the Invitation For Bids, manufacturer's test reports of ALL delivered lot numbers shall be required, and shall be submitted to the contract administrator in accordance with the schedule specified in the IFB.

VII. ORDERING DATA (This information is for Purchase and Contract use only)

The requisitioning officer shall state clearly:

A. Title, number, and effective date of this specification.
B. Type, and style of can liner.
C. Size of the liners and the approximate liquid gallon capacity.
D. Thickness and duty rating.
E. Color of liners (bags) and/or markings.
F. Quantities required in standard units of purchase.
G. Quantities required per case for specified size and thickness.
H. If a regularly scheduled, submittal of the manufacturer's product test reports to confirm compliance to the specifications are required in accordance with Section VI, D "Product Test Reports".
I. Selections for submission of representative samples per group and type of liners ordered.

Refer to the following for a list of the can liners physical properties cover by this specification.

Table 1 - Type 1, Style 1 (Linear Low Density and Low Density Can Liners)

Liquid Capacity (gallons)	W x D x L (in.)	Minimum Thickness (mils)	Load Duty	Load Rating (lbs. Min.)	Minimum Density Value (grams/cc)	Impact Resistance (grams)	Tear Strength (grams)	Minimum Net (Film) Case Weight (lbs) per 100 bag case [1]
5 to 9	12x8x21	0.5	light	10	0.915	40	100	1.4
7 to 10	15x9x23	0.5	light	15	0.915	40	100	1.8
11 to 20	15x9x32	0.5	light	15	0.915	40	100	2.5
7 to 10	15x9x23	1.6	medium	20	0.915	90	175	5.8
11 to 20	15x9x32	1.6	medium	25	0.915	90	175	8.1
20 to 30	16x14x36	1.6	medium	45	0.915	100	225	11.4
33	23x10x39	1.6	medium	45	0.915	100	225	13.6
40 to 45	23x17x46	1.6	medium	50	0.915	100	225	19.5
40 to 45	24x20x48	1.6	medium	50	0.915	100	225	22.3
55	22x14x58	1.6	medium	50	0.915	100	225	22.1
55 to 60	22x16x58	1.6	medium	50	0.915	100	225	23.3
55 to 60	22x16x60	1.6	medium	50	0.915	100	225	24.1
55 to 60	31x17x65	1.6	medium	50	0.915	100	225	33.0
20 to 30	16x14x36	2.2	heavy	60	0.915	150	275	15.7
33	23x10x39	2.2	heavy	60	0.915	150	275	18.7
40 to 45	23x17x46	2.2	heavy	70	0.915	150	275	26.8
40 to 45	24x20x48	2.2	heavy	70	0.915	150	275	30.7
55	22x14x58	2.2	heavy	70	0.915	150	275	30.4
55 to 60	22x16x58	2.2	heavy	70	0.915	150	275	32.1
55 to 60	22x16x60	2.2	heavy	70	0.915	150	275	33.2
55 to 60	31x17x65	2.2	heavy	70	0.915	150	275	45.4

[1] Bag quantity per case and the applicable minimum net case weight may vary in accordance with the bid. The minimum net case weight values are examples for the quantity of bags per case as indicated above.

Table 2 - Type 1, Style 2 (High Density Can Liners)

Liquid Capacity (gallons)	W x L (in.)	Minimum Thickness (microns)	Load Duty	Load Rating (lbs. Min.)	Minimum Density Value (grams/cc)	Impact Resistance (grams)	Minimum Net (Film) Case Weight (lbs) per 100 bag case [1]
7 to 10	24x24	6	light	10	0.940	40	0.9
20 to 30	24x33	8	light	15	0.940	40	1.7
30	30x37	11	medium	45	0.940	90	3.3
33	33x40	11	medium	45	0.940	90	3.9
50	40x48	14	medium	55	0.940	100	7.3
60	38x65	14	medium	55	0.940	100	9.4
55	36x58	14	medium	55	0.940	100	7.9
56	44x48	14	medium	55	0.940	150	8.0
30	30x37	17	heavy	65	0.940	150	5.1
33	33x40	17	heavy	65	0.940	150	6.1
45	40x48	17	heavy	70	0.940	150	8.9
56	44x48	17	heavy	70	0.940	150	9.8
60	36x58	17	heavy	70	0.940	150	9.6
60	38x65	17	heavy	70	0.940	150	11.4

[1] Bag quantity per case and the applicable minimum net case weight may vary in accordance with the bid. The minimum net case weight values are examples for the quantity of bags per case as indicated above.

Table 3 - Type 2 (Linear Low Density and Low Density Can Liners) DOT types

Liquid Capacity (gallons)	W x D x L (in.)	Minimum Thickness (mils)	Load Duty	Load Rating (lbs. Min.)	Minimum Density Value (grams/cc)	Impact Resistance (grams)	Tear Strength (grams)	Minimum Net (Film) Case Weight (lbs) per 100 bag case [1]
32[2]	23x10x39[2]	2	heavy	50	0.915	175	340	17.0
45	30x15x42	2	heavy	60	0.915	175	340	25.0
56[3]	23x17x48[3]	2	heavy	70	0.915	175	340	25.0

[1] Bag quantity per case and the applicable minimum net case weight may vary in accordance with the bid. The minimum net case weight values are examples for the quantity of bags per case as indicated above.
[2]Bags shall be orange, white, or blue in color. White bags are also marked “CSWP / DOT”
[3]Bag shall be provided with a flat side weld, not a bottom seal or seam.

Table 4 - Type 3 (Linear Low Density and Low Density Can Liners) DOC types

Liquid Capacity (gallons)	W x D x L (in.)	Minimum Thickness (mils)	Load Duty	Load Rating (lbs. Min.)	Minimum Density Value (grams/cc)	Impact Resistance (grams)	Tear Strength (grams)	Minimum Net (Film) Case Weight (lbs) per 100 bag case [1]
7 to 9	15x9x23	1.0	heavy	25	0.915	100	340	3.6
32	23x10x39	1.6	heavy	55	0.915	175	340	13.6
53	22x14x58	1.6	heavy	55	0.915	175	340	22.1

[1] Bag quantity per case and the applicable minimum net case weight may vary in accordance with the bid. The minimum net case weight values are examples for the quantity of bags per case as indicated above.

Table 5 - Type 4 (Linear Low Density and Low Density Can Liners) Biohazard types

Liquid Capacity (gallons)	W x D x L (in.)	Minimum Thickness (mils)	Load Duty	Load Rating (lbs. Min.)	Minimum Density Value (grams/cc)	Impact Resistance (grams)	Tear Strength (grams)	Minimum Net (Film) Case Weight (lbs) per 100 bag case [1]
7 to 9	15x9x23	1.5	medium	15	0.915	165	480	5.5
12 to 16	15x9x32	1.5	medium	15	0.915	165	480	7.6
20 to 27	16x14x36	1.5	medium	35	0.915	165	480	10.7
30	23x10x39	1.5	medium	45	0.915	165	480	12.8
40 to 42	23x17x46	1.5	medium	45	0.915	165	480	18.2
7 to 9	15x9x23	3.0	medium	15	0.915	165	480	5.5
12 to 16	15x9x32	3.0	heavy	15	0.915	165	480	15.2
20 to 27	16x14x36	3.0	heavy	35	0.915	165	480	21.4
30	23x10x39	3.0	heavy	45	0.915	165	480	25.5
40 to 42	23x17x46	3.0	heavy	45	0.915	165	480	36.5

[1] Bag quantity per case and the applicable minimum net case weight may vary in accordance with the bid. The minimum net case weight values are examples for the quantity of bags per case as indicated above.

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